2.3/29 Let $f(x) = \begin{cases} \boxed{2x^2+5}, & x<0 \\ \dfrac{3-5x^3}{1+4x+x^3}, & x \geq 0 \end{cases}$

a) $\lim_{x \to -\infty} f(x) = \lim_{x \to -\infty} 2x^2+5 = +\infty$

x "decreases without bound"

b) $\lim_{x \to +\infty} f(x) = \lim_{x \to \infty} \dfrac{3-5x^3}{1+4x+x^3} = -5$

$$\lim_{x \to \infty} \frac{x^3\left(\frac{3}{x^3}-5\right)}{x^3\left(\frac{1}{x^3}+\frac{4}{x^2}+1\right)}$$

$$= \lim_{x \to \infty} \frac{\frac{3}{x^3}-5}{\frac{1}{x^3}+\frac{4}{x^2}+1} = \frac{-5}{1} = -5$$

$$f(x) = \frac{x+5}{x+6}$$

$$g(x) = f(x) \cdot (\underline{\qquad})$$

$\lim_{x \to 0} g(x)$ is indeterminate

$$\lim_{x \to \infty} f(x) = \qquad \lim_{x \to 0} f(x) =$$

$$\lim_{x \to 0} \quad \frac{x^2+5x}{x^2+6x}, \quad \frac{\frac{1}{x}+\frac{5}{x^2}}{\frac{1}{x}+\frac{6}{x^2}}, \quad \frac{\cancel{x}(1+\frac{5}{x})}{\cancel{x}(1+\frac{6}{x})}, \quad \frac{x^3+5x^2}{x^3+6x^2}, \ldots$$

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2.2/37)

a) $\lim_{x\to 0^+}\left(\frac{1}{x}-\frac{1}{x^2}\right)=\lim_{x\to 0^+}\frac{1}{x}-\lim_{x\to 0^+}\frac{1}{x^2}$

$=\boxed{+\infty-(+\infty)}=0$ can not be done (individual limits don't exist)

p.123

2.2
37b

$$\lim_{x\to 0^+}\left(\frac{\cancel{x}}{\cancel{x}}\left(\frac{1}{x}\right)-\frac{1}{x^2}\right)=$$

$$\frac{x}{x^2}-\frac{1}{x^2}=\frac{x-1}{x^2}$$

$$\lim_{x\to 0^+}\frac{x-1}{x^2}$$

$$\frac{-1}{0}$$

$$\to -\infty$$

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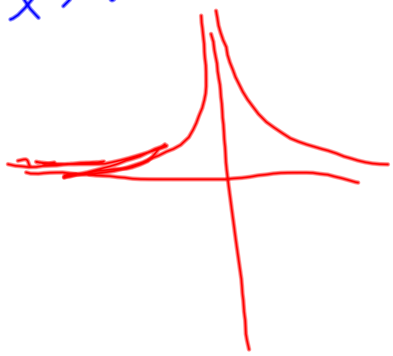
2.3/23

$$\lim_{x\to-\infty} \frac{\sqrt{3x^4+x}}{x^2-8} = \lim_{x\to-\infty} \frac{\sqrt{x^4\left(3+\frac{1}{x^3}\right)}}{x^2\left(1-\frac{8}{x^2}\right)}$$

$$= \lim_{x\to-\infty} \frac{\sqrt{x^4}\sqrt{3+\frac{1}{x^3}}}{x^2\left(1-\frac{8}{x^2}\right)} = \lim_{x\to-\infty} \frac{\sqrt{3+\frac{1}{x^3}}}{1-\frac{8}{x^2}} = \frac{\sqrt{3}}{1}$$

$$\frac{x^1}{x^4} = x^{1-4} = x^{-3} = \frac{1}{x^{+3}}$$

$$3x^4+x = x^4\left(\left(\frac{3x^4}{x^4}\right)+\left(\frac{x^1}{x^4}\right)\right)$$



$$\lim_{x \to -\infty} \frac{\sqrt{3x^2+x}}{x-8} = \lim_{x \to -\infty} \frac{\sqrt{x^2\left(3+\frac{1}{x}\right)}}{x\left(1-\frac{8}{x}\right)}$$

$$= \frac{\sqrt{x^2}\sqrt{3+\frac{1}{x}}}{x\left(1-\frac{8}{x}\right)} = {}^{+}\sqrt{3}$$

BUT this is always NEGATIVE for every $x < -\frac{1}{3}$ . . . . ?